

Chapter 2: Alternatives

This chapter describes the alternatives that were considered for meeting the purpose of the S.R. 108 project as described in Chapter 1, Purpose of and Need for Action. This chapter reviews the alternatives that were eliminated from detailed study through the screening process, describes the No-Action Alternative and the action alternatives that were carried forward for detailed study, and summarizes the advantages and disadvantages of the No-Action and action alternatives.

2.1 Alternative Development Process

A range of alternatives to consider in this EIS was developed through the National Environmental Policy Act (NEPA) public and agency involvement process. Eight initial alternatives were developed during the scoping phase of the project. These initial alternatives were put through a two-step screening process to determine which alternatives would be carried forward for detailed study. The two steps used in the screening process are:

- **Level 1 Screening.** The initial alternatives were evaluated to determine how well they met the three elements of the project's purpose (see Section 1.2.1, Purpose of the Project). Those alternatives that did not meet all of the project's purpose were eliminated from further study. (However, no initial alternative was eliminated solely because it did not meet the purpose of eliminating roadway deficiencies on S.R. 108.) Those alternatives that did meet all of the project's purpose were further evaluated with level 2 screening.
- **Level 2 Screening.** The alternatives that made it through level 1 screening were evaluated to determine their impacts to the community (such as relocations and Section 4(f) impacts) and their impacts to the natural environment (such as wetland impacts) so that the alternatives with the least amount of impacts would be carried forward for detailed study and the alternatives with the greatest impacts would be eliminated.

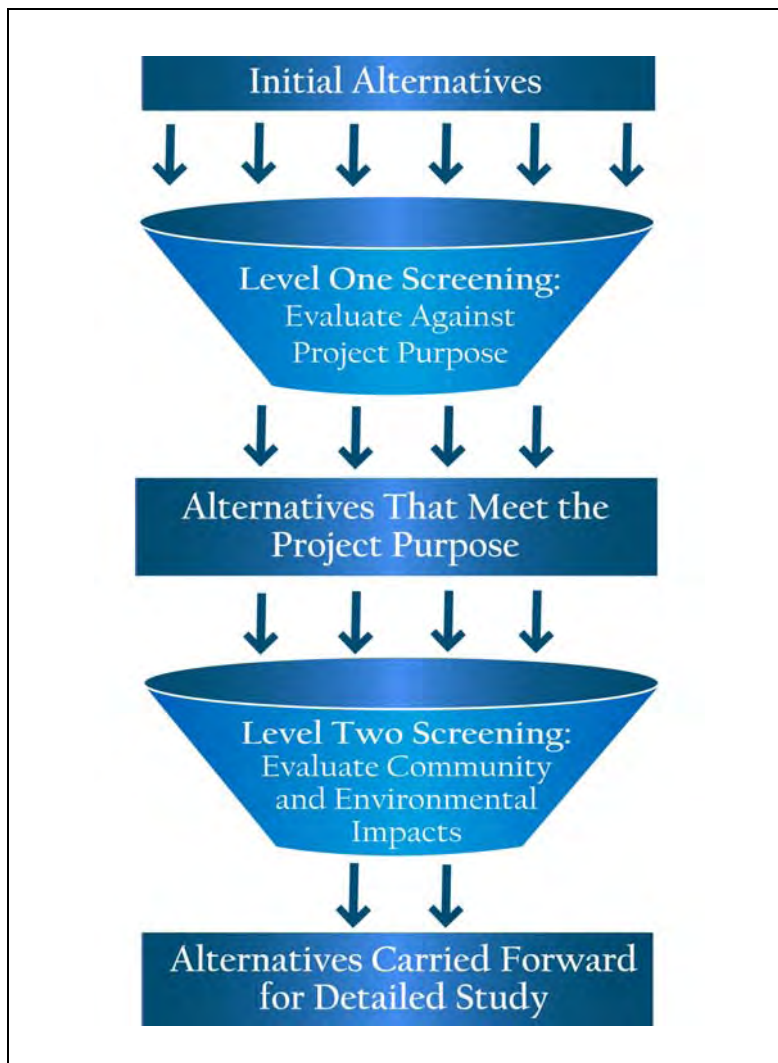


Any alternative that has been carried forward for detailed study is one that will meet all of the project's purpose while minimizing impacts to the communities and the natural environment.

The action alternatives that were carried forward for detailed study were further refined by developing the preliminary engineering and associated cost estimates and determining right-of-way requirements so that additional evaluation of impacts could be conducted. The detailed information provided by the preliminary engineering and the development of cost estimates was not necessary for conducting level 1 and 2 screening.

Exhibit 2.1-1 illustrates the alternative development process.

Exhibit 2.1-1: S.R. 108 Alternative Development Process



2.1.1 Development of the Initial Alternatives

Eight initial alternatives were developed during the project scoping process. These initial alternatives were developed with input from existing land use and transportation plans, the public, local cities, and resource agencies. The input was collected during public meetings, at alternative development workshops with the public and cities, and from comments that were submitted on the project Web site or mailed in. Exhibit 2.1-2 shows the initial alternatives.

Exhibit 2.1-2: Initial Alternatives

Alternative	Description
No-Action	No improvements to S.R. 108 would be made under this alternative except for routine maintenance.
TSM (Transportation System Management)	This alternative consists of timing and coordinating traffic signals along S.R. 108 and adding left-turn and right-turn lanes at key intersections.
Transit Only	This alternative includes the TSM Alternative plus more-frequent bus service. The current bus service (Route 626) operates hourly and would be increased to high-frequency bus service that would operate every 15 minutes. Other modes of transit, such as commuter rail and light rail, were not considered prudent for S.R. 108 because they would not connect to other local or regional fixed-guideway transit such as the proposed commuter rail along I-15 about 3 miles east of S.R. 108. In addition, fixed-guideway transit on S.R. 108 is not compatible with UTA's or WFRC's long-range plans for transit in the area. Bus service on S.R. 108 would connect to UTA's proposed commuter rail line along I-15 into Salt Lake City and would provide the necessary regional connectivity.
Three Lanes	This alternative consists of two travel lanes with a raised center median and dedicated turn lanes at intersections. The alternative includes left-turn and right-turn lanes at intersections, appropriate shoulders for local access, and pedestrian, bicycle, and transit facilities.
TSM, Transit Only, and Three Lanes	This alternative is a combination of the TSM, Transit Only, and Three-Lane Alternatives.
Five Lanes	This alternative consists of four travel lanes with a raised center median and dedicated turn lanes at intersections. The alternative includes left-turn and right-turn lanes at intersections, appropriate shoulders for local access, and pedestrian, bicycle, and transit facilities.
Seven Lanes	This alternative consists of six travel lanes with a raised center median and dedicated turn lanes at intersections. The alternative includes left-turn and right-turn lanes at intersections, appropriate shoulders for local access, and pedestrian, bicycle, and transit facilities.
Improve Other Area Roads	This alternative consists of widening 1000 West or 3000 West to five lanes and building the proposed North Legacy Parkway. No improvements to S.R. 108 would be made under this alternative.



Land Use Considerations in the Alternative Development

Process. During the scoping phase of the S.R. 108 project, a comment was received suggesting that changes to land use should be considered in the alternative development process. A change in land use from typical large-lot residential and commercial developments to mixed-use and compact developments can reduce the amount of necessary vehicle travel, increase transit use, and improve local and regional mobility.

Two types of land use in particular can reduce the amount of vehicle travel: compact developments, where individual properties are built close together to leave more open space, and mixed-use developments, where complimentary land uses such as residential and commercial properties are built in the same area so that residents can make shorter vehicle trips or eliminate them altogether.

The cities along S.R. 108 are planning to reduce the amount of vehicle travel by developing a corridor with a mix of residential and commercial uses. When the corridor is completely developed, it will have an even mix of residential uses and different types of commercial uses. For example, the City of West Haven is promoting a mixed-use district with townhomes, compact development, and commercial uses. The other cities along S.R. 108 are implementing a mix of commercial and residential uses including more compact developments. Section 3.1, Land Use, shows the proposed future land use and zoning along S.R. 108 including the mixed-use developments proposed by the cities (see Exhibit 3.1-2: Land Use and Exhibit 3.1-3: Zoning).

The commercial land uses along S.R. 108 will help reduce overall regional travel by providing local shopping and services for residents along S.R. 108 and west of I-15. Without these businesses along S.R. 108, many residents would need to travel greater distances for shopping and services. These businesses will also provide nearby employment for residents. All of the alternatives evaluated for the S.R. 108 project incorporate the proposed mixed-use developments recommended by the cities, and the regional travel demand model that was used to predict future traffic on S.R. 108 takes into account the trend toward mixed-use development along S.R. 108.

What is the regional travel demand model?

The regional travel demand model is a tool for predicting future traffic and level of service conditions on regional roadways such as major arterials and freeways. The model is maintained by the Wasatch Front Regional Council.

2.1.2 Level 1 Screening

Level 1 screening was performed on the eight initial alternatives that were identified during the project scoping process (see Exhibit 2.1-2: Initial Alternatives above). These alternatives were evaluated against the three elements of the project's purpose as defined in Chapter 1, Purpose of and Need for Action:

- Reduce roadway congestion on S.R. 108.
- Eliminate the roadway deficiencies associated with a lack of shoulders and turn lanes in order to reduce accident rates on S.R. 108. (No alternative was eliminated solely because it did not meet this purpose.)
- Enhance the opportunities for multi-modal use of S.R. 108 by providing improved bicycle, pedestrian, and transit facilities consistent with local and regional land use and transportation plans.

If an alternative met all three elements of the project's purpose, it was carried forward for level 2 screening. Those alternatives that did not meet the project's purpose were eliminated from further study.

2.1.2.1 Evaluation of the Initial Alternatives

This section summarizes the evaluation of the initial alternatives in terms of how well they met the purpose of the project. These initial alternatives are described in Exhibit 2.1-2: Initial Alternatives above.

Methodology for Evaluating the Level of Service. A regional travel demand model was used to calculate the level of service for the initial alternatives and to determine whether each alternative would improve local and regional mobility in Syracuse, West Point, Clinton, Roy, and West Haven by reducing roadway congestion on S.R. 108. Typically, in urban areas, LOS D is considered acceptable and LOS E and LOS F are generally considered unacceptable. In some cases in urban areas, LOS E is considered acceptable if there are constraints that prevent roadway improvements from being made (such as high cost, right-of-way limitations, or high community and environmental impacts).

What is level of service?

Level of service, or LOS, is a method of describing the congestion level of a street or freeway using a letter "grade" from A to F. LOS A represents excellent traffic conditions and LOS F represents heavy congestion. For more information, see Section 1.4.3, Current and Future Traffic Congestion.



Initially, to evaluate the reduction in roadway congestion under the alternatives, a level of service of LOS D was used as a screening criterion since this level of service is typically considered acceptable in urban areas. However, for the S.R. 108 project, LOS E would be considered acceptable along a few segments if improving the road to LOS D by adding more lanes would result in substantial relocations, community impacts, Section 4(f) impacts, or environmental impacts. A level of service of LOS F—forced flow and excessive delays—was not considered an acceptable operating condition for an alternative.

To achieve the best flow of traffic, the level of service analysis in Exhibit 2.1-3 below assumes a raised center median along S.R. 108 except for intersections where left-turn lanes would be provided. Median treatments for roads are one of the most effective ways to regulate access, but they are also the most controversial. The two major median treatments are two-way left-turn lanes and raised medians. Many studies have found substantial safety benefits from median treatments, particularly raised medians. According to an analysis of accident data in seven states, raised medians reduce accidents by over 40% in urban areas (Gluck and others 1999). In addition, raised medians improved the level of service by one full grade in some areas (for example, from LOS D to LOS C) and increased lane capacity by as much as 36% (Iowa Department of Transportation 1997).

Raised medians also provide extra protection for pedestrians. A study of median treatments in Georgia found that raised medians reduced accidents involving pedestrians by 45% and reduced pedestrian fatalities by 78% compared to two-way left-turn lanes (FHWA, no date). Based on the above analysis and the need to maximize safety and roadway capacity, the initial alternatives were evaluated with a raised median.

What is a roadway median?

The *median* is the area between opposing lanes of traffic. Medians can either be open (no barrier or turn lane) or they can have various types of *median treatments*, such as a low concrete barrier (raised median) or a two-way left-turn lane.

Why does a raised median improve traffic flow?

Raised medians prevent vehicles from making left turns across lanes of traffic (either left turns from the roadway into driveways or left turns from driveways onto the roadway). Left turns slow the flow of traffic and increase accidents. Studies show that raised medians can improve traffic flow.

Evaluation of the Level of Service. Exhibit 2.1-3 provides an overview of the level of service expected in 2035 on nine segments of S.R. 108. S.R. 108 was divided into nine segments to help determine what type of improvements based on level of service would be necessary for specific areas along S.R. 108. The roadway segments represent sections of S.R. 108 between the major intersections. The locations of the nine segments are shown in Exhibit 2.1-4 below.

The shaded cells in Exhibit 2.1-3 indicate segments of S.R. 108 that do not meet the level 1 screening criterion of LOS D. Note that the Improve Other Area Roads Alternative (see page 2-13) was not evaluated using the regional travel demand model, so it is discussed qualitatively later in this chapter rather than included in the table.

Exhibit 2.1-3: Comparison of Level of Service for the Initial Alternatives with Raised Medians

Alternative	Level of Service (LOS) on S.R. 108 Segment in 2035								
	1	2	3	4	5	6	7	8	9
No-Action	F	F	F	F	F	F	F	F	F
TSM	F	F	F	F	F	F	F	F	E
Transit Only	E	F	F	F	F	F	F	F	E
Three Lanes	D	F	F	F	F	F	E	F	D
TSM, Transit Only, and Three Lanes	C	F	F	F	F	F	E	F	C
Five Lanes	B	C	C	D	E	D	C	C	B
Seven Lanes	A	C	C	C	C	C	B	C	B

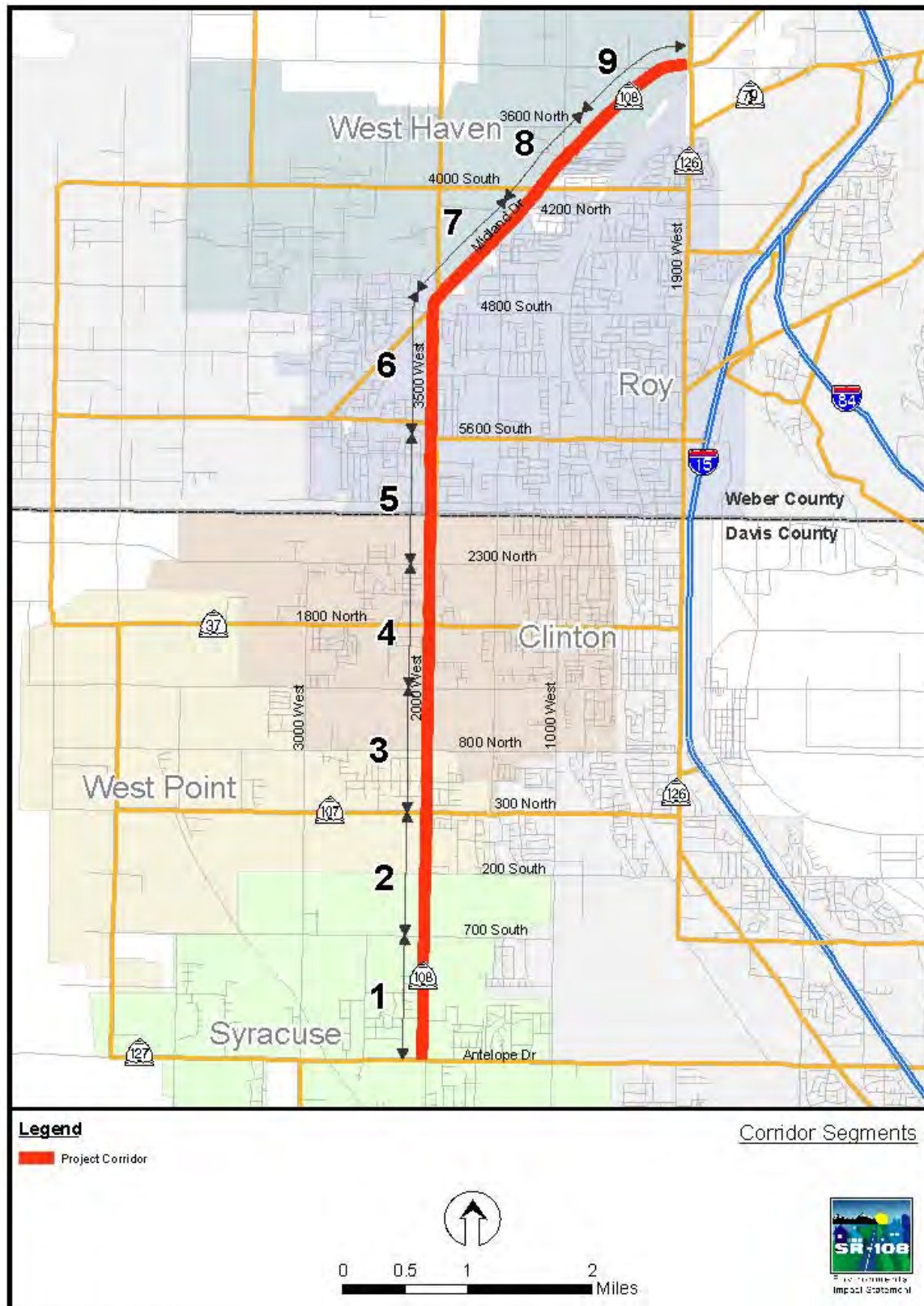
Source: InterPlan 2006b

Shaded cells indicate segments that do not meet the level 1 screening criterion of LOS D.

LOS A = free flow, no delays; LOS B = stable flow, minimal delays; LOS C = stable flow, acceptable delays; LOS D = restricted flow, regular delays; LOS E = maximum capacity, extended delays; LOS F = forced flow, excessive delays



Exhibit 2.1-4: Corridor Segments



Because many residents and business owners are concerned that a raised center median would reduce access to properties along S.R. 108, a level of service evaluation without a raised center median was also conducted. As shown in Exhibit 2.1-5, the initial alternatives would operate at a reduced level of service without a raised center median compared to having a raised center median.

Exhibit 2.1-5: Comparison of Level of Service for the Initial Alternatives without Raised Medians

Alternative	Level of Service (LOS) on S.R. 108 Segment in 2035								
	1	2	3	4	5	6	7	8	9
No-Action	F	F	F	F	F	F	F	F	F
TSM	F	F	F	F	F	F	F	F	E
Transit Only	F	F	F	F	F	F	F	F	E
Three Lanes	E	F	F	F	F	F	E	F	D
TSM, Transit Only, and Three Lanes	D	F	F	F	F	F	E	F	C
Five Lanes	B	D	D	E	F	E	C	C	B
Seven Lanes	A	C	C	C	C	C	C	C	B

Source: InterPlan 2006b

Shaded cells indicate segments that do not meet the level 1 screening criterion of LOS D.

LOS A = free flow, no delays; LOS B = stable flow, minimal delays; LOS C = stable flow, acceptable delays; LOS D = restricted flow, regular delays; LOS E = maximum capacity, extended delays; LOS F = forced flow, excessive delays

Because none of the alternatives other than the Seven-Lane Alternative would meet the level 1 screening criterion without a raised center median, the evaluation for the action alternatives below was based on a raised center median so that the best level of service could be provided for the initial alternatives.

No-Action and TSM Alternatives

The No-Action and TSM Alternatives would not add any travel lanes to S.R. 108. As shown in Exhibit 2.1-3: Comparison of Level of Service for the Initial Alternatives with Raised Medians above, these alternatives would not meet the purpose of reducing congestion on S.R. 108 as demonstrated by their failure to achieve the screening criterion of LOS D. As shown in Exhibit 2.1-3, if additional travel lanes are not added, the amount of future traffic would exceed the capacity of the road, resulting in LOS F along all segments of S.R. 108. In addition, by making no improvements to S.R. 108, these

Why was the TSM Alternative eliminated from further study?

The TSM Alternative was eliminated because it did not meet any of the three purpose elements.



alternatives would not meet the project purpose of eliminating roadway deficiencies and providing a multi-modal facility.

Based on the above evaluation, the TSM Alternative and the No-Action Alternative do not meet any of the three purpose elements. For this reason, the TSM Alternative was eliminated from further study. However, as required by NEPA, the No-Action Alternative was carried forward for detailed study. The No-Action Alternative serves as a baseline so that decision-makers can compare the environmental effects of the action alternatives. The TSM elements of the No-Action Alternative were carried forward in each of the action alternatives along with Transportation Demand Management, which consists of improving pedestrian-oriented design elements, improving transit infrastructure, and including a bicycle-friendly facility and environment.

Transit-Only Alternative

The Transit-Only Alternative would provide more-frequent bus service along S.R. 108. Other modes of transit, such as commuter rail and light rail, are not identified in UTA's or WFRC's long-range transit plans, but S.R. 108 is being considered for enhanced bus service with a connection to UTA's proposed commuter rail line into Salt Lake City. The Transit-Only Alternative would not meet the purpose of reducing congestion on S.R. 108 as demonstrated by the alternative's failure to achieve the screening criterion of LOS D. As shown above in Exhibit 2.1-3: Comparison of Level of Service for the Initial Alternatives with Raised Medians, this alternative would result in S.R. 108 operating at LOS F along seven of the nine segments because the amount of future traffic would exceed the capacity of the road.

In addition, because it would not make any improvements to S.R. 108, this alternative would not meet the project purpose of eliminating roadway deficiencies. The alternative would meet the purpose of providing a multi-modal facility.

The Transit-Only Alternative was eliminated from further study because it did not meet two of the three purpose elements. However, this alternative was included as part of all of the action alternatives evaluated in this EIS.

Why was the No-Action Alternative carried forward for further study?

The No-Action Alternative was carried forward because NEPA requires an analysis of a No-Action Alternative. This alternative serves as a baseline so that decision-makers can compare the environmental effects of the action alternatives.

Why was the Transit-Only Alternative eliminated from further study?

The Transit-Only Alternative was eliminated because it did not meet two of the three purpose elements (reducing roadway congestion on S.R. 108 and eliminating roadway deficiencies).

Three-Lane Alternative

The Three-Lane Alternative would consist of two travel lanes with a raised center median and would include left-turn and right-turn lanes at intersections, appropriate shoulders, and pedestrian, bicycle, and transit facilities. This alternative would meet the project purposes of providing a multi-modal facility and eliminating roadway deficiencies.

However, the Three-Lane Alternative would not meet the purpose of reducing congestion on S.R. 108, as demonstrated by the alternative's failure to achieve the screening criterion of LOS D. As shown in Exhibit 2.1-3: Comparison of Level of Service for the Initial Alternatives with Raised Medians above, this alternative would result in S.R. 108 operating at LOS F along six of the nine segments and at LOS E along one of the nine segments.

The Three-Lane Alternative was eliminated from further study because it did not meet one of the three purpose elements.

Why was the Three-Lane Alternative eliminated from further study?

The Three-Lane Alternative was eliminated because it did not meet one of the three purpose elements (reducing roadway congestion on S.R. 108).

TSM, Transit Only, and Three-Lane Alternatives

This alternative is a combination of the TSM, Transit-Only, and Three-Lane Alternatives. This alternative would meet the purposes of providing a multi-modal facility and improving roadway deficiencies. However, this alternative would not meet the purpose of reducing congestion on S.R. 108, as demonstrated by the alternative's failure to achieve the screening criterion of LOS D. As shown in Exhibit 2.1-3: Comparison of Level of Service for the Initial Alternatives with Raised Medians above, this alternative would result in S.R. 108 operating at LOS F along six of the nine segments.

This alternative was eliminated from further study because it did not meet one of the three purpose elements.

Why was the combination of the TSM, Transit-Only, and Three-Lane Alternatives eliminated from further study?

This alternative was eliminated because it did not meet one of the three purpose elements (reducing roadway congestion on S.R. 108).



Five-Lane Alternative

The Five-Lane Alternative would consist of four travel lanes with a raised center median and would include left-turn and right-turn lanes at intersections, appropriate shoulders, and pedestrian, bicycle, and transit facilities. As shown in Exhibit 2.1-3: Comparison of Level of Service for the Initial Alternatives with Raised Medians above, the Five-Lane Alternative would meet the LOS D screening criterion except for one segment that would operate at LOS E.

The level of service of LOS E in one segment is acceptable if widening the road beyond five lanes to achieve LOS D would result in substantially more relocations or environmental impacts.

Compared to the Seven-Lane Alternative, the Five-Lane Alternative would have substantially fewer relocations, community impacts, Section 4(f) impacts, and environmental impacts. For the reasons stated in Section 2.1.2.1, Evaluation of the Initial Alternatives, the operation of one segment at LOS E is considered to be acceptable, given the substantially fewer relocations, Section 4(f) impacts, and environmental impacts of this alternative. Under this alternative, no segments of the road would operate at LOS F.

In addition, this alternative would meet the project purposes of providing a multi-modal facility and improving roadway deficiencies.

Because the Five-Lane Alternative meets the project's purpose, it was carried forward for level 2 screening.

Note that the Five-Lane Alternative operates at an acceptable level of service without a raised median on all segments except segments 4, 5, and 6 (see Exhibit 2.1-5: Comparison of Level of Service for the Initial Alternatives without Raised Medians above). Therefore, this alternative could be carried forward into level 2 screening without a raised median for most of the alternative and a raised median for only segments 4, 5, and 6. The use of dual left-turn lanes at certain intersections could also improve traffic flow and capacity enough to eliminate the need for raised medians.

Why was the Five-Lane Alternative carried forward for further study?

The Five-Lane Alternative was carried forward because it met all of the three purpose elements.

Seven-Lane Alternative

The Seven-Lane Alternative would consist of six travel lanes with a raised center median and would include left-turn and right-turn lanes at intersections, appropriate shoulders, and pedestrian, bicycle, and transit facilities. Of all the initial alternatives, only the Seven-Lane Alternative would achieve the screening criterion of LOS D or better for every segment of S.R. 108 that was evaluated. Therefore, this alternative would meet the purpose of reducing congestion on S.R. 108. This alternative would also meet the purposes of providing a multi-modal facility and improving roadway deficiencies.

The Seven-Lane Alternative would meet the purpose criteria for level 1 screening. However, the capacity of this alternative would far exceed the projected traffic in 2035, as shown by the projected levels of service of LOS A through LOS C in Exhibit 2.1-3: Comparison of Level of Service for the Initial Alternatives with Raised Medians above. Because the Seven-Lane Alternative would far exceed the need for the project and would result in substantially more relocations and environmental impacts as a result of the 24 feet of additional right-of-way, it was considered unreasonable.

The Seven-Lane Alternative would require a much wider cross-section (134 feet) than the Five-Lane Alternative (110 feet). The narrower Five-Lane Alternative would accommodate most of the projected traffic while causing substantially fewer impacts to existing homes, community cohesion, and Section 4(f) properties. Finally, the local and regional plans recommend a five-lane road because a seven-lane road would result in numerous residential and business relocations. (For a description of Section 4(f) properties, see the section titled Other Considerations on page 2-15.)

Based on the above evaluation, the severity of impacts from a Seven-Lane Alternative was considered unreasonable, and therefore this alternative was eliminated from further study.

Improve Other Area Roads Alternative

During the S.R. 108 scoping process, several public comments suggested that improvements should be made to other north-south roads adjacent to S.R. 108 to reduce congestion and the need for improvements to S.R. 108. Some comments suggested widening

Why was the Seven-Lane Alternative eliminated from further study?

The Seven-Lane Alternative was eliminated because it would far exceed the need for the project and would result in substantially more relocations and environmental impacts than the Five-Lane Alternative. For these reasons, the Seven-Lane Alternative was considered unreasonable.



1000 West or 3000 West, and other comments suggested that building the North Legacy Parkway west of the project area would reduce the need for improvements to S.R. 108. In response to these comments, the Improve Other Area Roads Alternative was developed and evaluated.

Because 1000 West and 3000 West (see Exhibit 2.1-4: Corridor Segments above) are not included in the regional travel demand model, a level of service analysis using the model could not be conducted for this alternative. Instead, a qualitative level of service analysis was conducted. In addition, this alternative was evaluated with regard to the other two elements of the project's purpose.

Qualitative Level of Service Analysis

UDOT used the principles of travel demand and traffic flow to conduct a qualitative level of service analysis that examines how the Improve Other Area Roads Alternative would affect the level of service on S.R. 108.

1000 West and 3000 West are discontinuous roads that do not extend the full length of the S.R. 108 project area. The travel time on either a widened 1000 West or a widened 3000 West would be longer than the travel time on a similarly sized S.R. 108 for two reasons. First, drivers would need to access 1000 West or 3000 West using smaller east-west roads including residential streets, while drivers on S.R. 108 would not have any east-west travel. Second, drivers would need to make additional left and right turns through the project area compared to traveling through the area on S.R. 108 only.

Because of the out-of-direction travel and additional stops and turns, travel times on 1000 West or 3000 West would not be substantially shorter than travel times on S.R. 108. Given this situation, some drivers would choose the less-congested but longer routes of 1000 West or 3000 West, while other drivers would choose the more-congested but more direct route of S.R. 108.

In addition, many drivers travel on S.R. 108 to access the businesses and residences along S.R. 108. These drivers would probably choose to travel entirely on S.R. 108 regardless of the congestion level rather than use 1000 West or 3000 West for part of their route. For these reasons, the qualitative level of service analysis concluded that the

Why was the Improve Other Area Roads Alternative eliminated from further study?

The Improve Other Area Roads Alternative was eliminated because it did not meet any of the three purpose elements.

Improve Other Area Roads Alternative would not substantially improve the level of service on S.R. 108.

Eliminate Roadway Deficiencies Associated with Lack of Shoulders and Turn Lanes To Reduce Accident Rates on S.R. 108

Under this alternative, improvements would be made to either 1000 West or 3000 West and no improvements would be made to S.R. 108. Because none of the roadway deficiencies identified for S.R. 108 would be eliminated, this alternative would not meet this purpose element.

Enhance the Opportunity for Multi-modal Use of S.R. 108

Because this alternative would not involve any improvements to S.R. 108, the alternative would not enhance the opportunity of multi-modal use by providing improved transit facilities for existing bus service or improving bicycle or pedestrian facilities. Therefore, this alternative would not meet this purpose element.

Other Considerations

S.R. 108 offers regional mobility by providing a through street from Antelope Drive to S.R. 126. Within the project area, neither 1000 West nor 3000 West are continuous north-south roads. Both roads would need to be continuous north-south roads to meet the project purpose of improving local and regional mobility. 1000 West ends at 2300 South (Shoestring Park) in Clinton and at 4800 South in Roy at an area planned for industrial development. Making 1000 West a through north-south road would require removing both the park (a Section 4(f) property) and the industrial area, and neither of these changes would be compatible with the City of Roy's long-term development plans. In addition, widening the road would affect both Kiwanis Park and Heritage Park in Clinton, both of which are Section 4(f) properties.

3000 West currently ends at Ponds Park in Clinton at about 2300 North and starts again at 6000 South in Roy. Completing this segment as a through road would affect Ponds Park in Clinton (a Section 4(f) property). The road ends again at 4000 South in West Haven, so it does not provide a complete north-south connection.

Why must Section 4(f) properties be avoided?

Section 4(f) is part of an FHWA regulation that requires a project to avoid the use of historic properties that are eligible or potentially eligible for the National Register of Historic Places and recreation and wildlife areas unless there is no feasible and prudent alternative to such use. Even then, all measures must be taken to minimize harm to these properties.



Building the road north of 4000 South would cause impacts to a housing development.

All of the cities' transportation and land use plans identify the need to improve S.R. 108 by widening the existing road. The cities propose widening the road to meet their goal of establishing S.R. 108 as a primary or secondary commercial corridor. In addition, the WFRRC Regional Transportation Plan recommends widening S.R. 108. Not improving S.R. 108 would be inconsistent with local and regional land use plans and would not meet the local growth objectives.

The Syracuse and Clinton zoning and land use plans show 1000 West and 3000 West being developed as primarily residential corridors. There are five parks along these corridors: three in Clinton along 1000 West and one in Clinton and another in Roy along 3000 West. Therefore, widening the roads to five lanes would not be consistent with the land use plans that include residential developments. In addition, both cities' transportation plans show these roads as minor collectors of either two or three lanes that provide service to residential developments, not as five-lane roads.

Proposed North Legacy Parkway

The planned North Legacy Parkway project is proposed as a four-lane, limited-access road about 1 mile west of the project area that would provide a continuous north-south facility. The North Legacy Parkway project is in the WFRRC Regional Transportation Plan and was included as part of the No-Action Alternative for the S.R. 108 project. Even if the North Legacy Parkway were built, the level of service on S.R. 108 would be LOS F, so improvements to S.R. 108 would still be needed even with the Legacy Parkway.

Conclusion

In summary, widening 1000 West or 3000 West would not eliminate roadway deficiencies and would not improve multi-modal use of S.R. 108. In addition, widening these roads would not provide regional connectivity or substantially reduce congestion on S.R. 108. For these reasons, the Improve Other Area Roads Alternative was eliminated from further study.

2.1.2.2 Level 1 Screening Results

As shown in Exhibit 2.1-6, there is no initial alternative or combination of the initial alternatives, other than the Five-Lane Alternative, that would meet all of the project's purpose while avoiding the excessive impacts of the Seven-Lane Alternative. Therefore, only the Five-Lane Alternative was carried forward for level 2 screening.

Exhibit 2.1-6: Level 1 Screening Results (Evaluate Alternatives against the Project Purpose)

Purpose Element	Alternative							
	No-Action	TSM	Transit Only	Three Lanes	TSM, Transit Only, and Three lanes	Five Lanes	Seven Lanes ^a	Improve Other Area Roads
Reduce roadway congestion on S.R. 108.	No	No	No	No	No	Yes	Yes	NA
Eliminate the roadway deficiencies associated with a lack of shoulders and turn lanes in order to reduce accident rates on S.R. 108.	No	No	No	Yes	Yes	Yes	Yes	No
Enhance the opportunities for multi-modal use of S.R. 108 by providing improved bicycle, pedestrian, and transit facilities consistent with local and regional land use and transportation plans.	No	No	Yes	Yes	Yes	Yes	Yes	No

NA = not applicable

^a The Seven-Lane Alternative was determined to be unreasonable because it would have substantially more impacts to homes (due to relocations) and environmental resources.

2.1.3 Level 2 Screening

The purpose of level 2 screening was to further refine and develop the alternatives that met all of the project purpose elements in level 1 screening. For this project, the only alternative that passed the level 1 screening was the Five-Lane Alternative. As noted in Section 2.1.2.1, Evaluation of the Initial Alternatives, the Seven-Lane Alternative passed the level 1 screening but was determined to be unreasonable because it would have substantially more impacts to homes (due to relocations) and environmental resources. The level 2 screening was conducted to ensure that the alternatives with the least amount of impacts to the communities and the natural environment would be carried forward for detailed study in this EIS and that the alternatives with the greatest impacts would be eliminated. To evaluate these impacts, a different set of criteria from the level 1 screening criteria was developed. This evaluation also required the



alternatives' roadway widths and alignments to be refined. The level 2 screening process consisted of two steps:

- Development of the preliminary five-lane alternatives
- Evaluation of these alternatives

If the alternative refinements that were made during the level 2 screening had been done for the initial set of alternatives, this would not have changed how well the initial alternatives met the project's purpose.

2.1.3.1 Development of the Preliminary Five-Lane Alternatives

This section explains how the preliminary five-lane alternatives were developed so that the alternatives' impact to the community and the natural environment could be evaluated. For the Five-Lane Alternative that passed the level 1 screening, five different alignment alternatives were developed and evaluated in more detail to develop a range of reasonable alternatives to be considered in this EIS. The five alignment alternatives represent the different alignment variations that could be implemented under the Five-Lane Alternative. These five alignments are referred to as the preliminary five-lane alternatives.

Exhibit 2.1-7 describes the five alternatives that were evaluated during level 2 screening. These alternatives are shown below in Exhibit 2.1-8.

What are the preliminary five-lane alternatives?

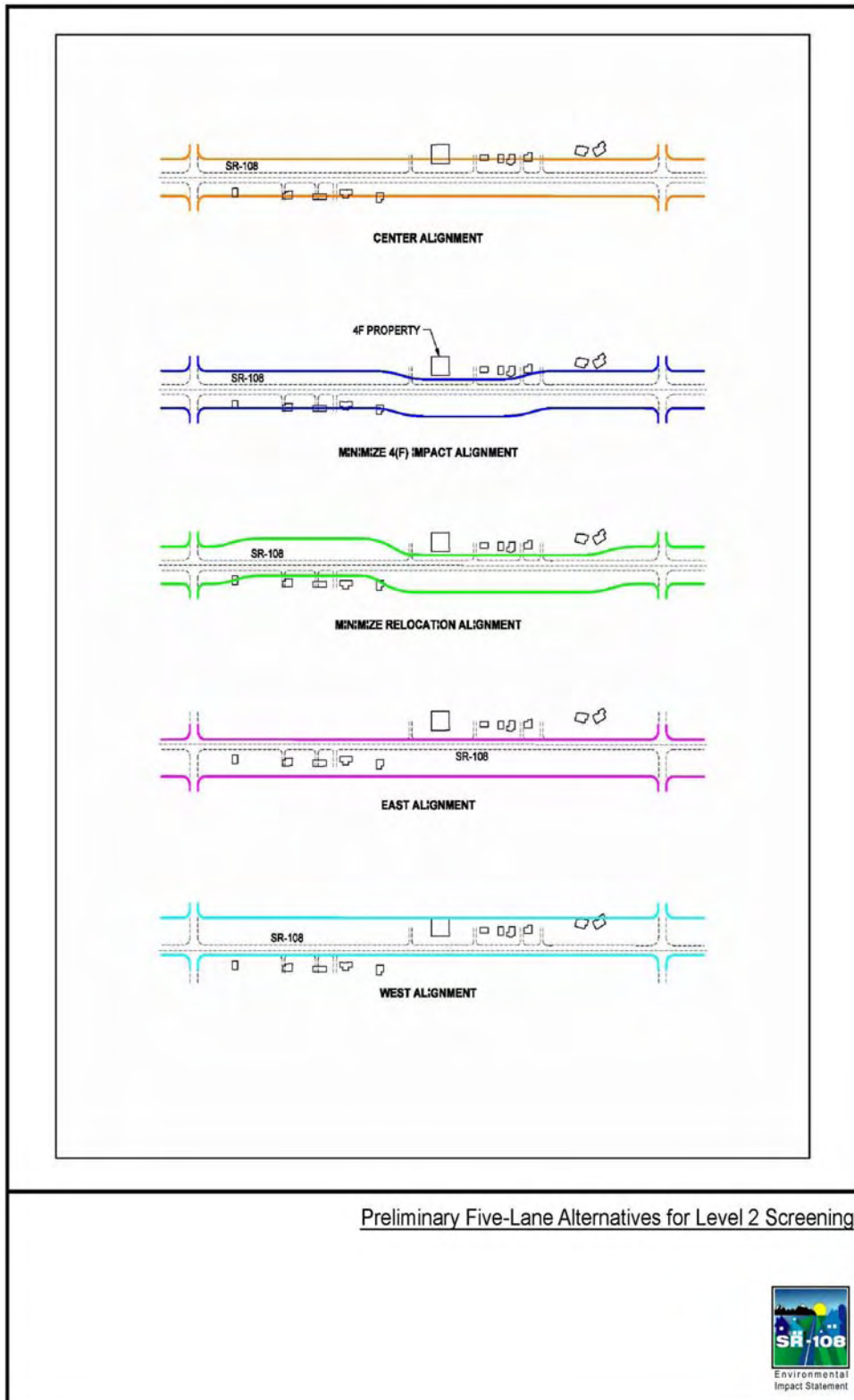
The preliminary five-lane alternatives are the different alignment variations that could be implemented under the Five-Lane Alternative. The preliminary five-lane alternatives were evaluated using level 2 screening.

Exhibit 2.1-7: Preliminary Five-Lane Alternatives

Alternative	Cross-Section Width	Description
Center Alignment	110 feet	Widen the roadway equally to the west and east.
Minimize 4(f) Impacts Alignment	110 feet	Widen the roadway to both the west and east to minimize Section 4(f) impacts.
Center Meander Alignment	110 feet	Widen the roadway to both the west and east to minimize overall property impacts, regardless of Section 4(f) status.
East Alignment	110 feet	Widen the roadway primarily to the east.
West Alignment	110 feet	Widen the roadway primarily to the west.



**Exhibit 2.1-8: Preliminary Five-Lane Alternatives for
Level 2 Screening**





Typical Cross-Sections. All of the preliminary five-lane alternatives would include the following improvements to S.R. 108. These improvements are shown in Exhibit 2.1-9 and Exhibit 2.1-10 below.

- Widen S.R. 108 to a 110-foot, five-lane cross-section consisting of four 12-foot travel lanes, a 14-foot median (either a two-way left-turn lane or a raised center median), 8-foot shoulders, 4-foot bicycle lanes, 2.5-foot curb and gutter, 4.5-foot park strips, 4-foot sidewalks, and 1 foot between the back of the sidewalk and the edge of the right-of-way.
- Improve most intersections with dedicated right-turn and left-turn lanes.
- Include enough shoulder width to accommodate bus service.

Hinckley Drive Extension. For the preliminary five-lane alternatives considered in level 2 screening in the Draft EIS, it was assumed that the Hinckley Drive extension at 3600 South on S.R. 108 would be in place because the project is funded for construction in 2010 (see Section 1.3.4, Related Projects). The screening in the Draft EIS assumed the connection from S.R. 108 to Hinckley Drive to be an extension of S.R. 108 without traffic signals and assumed that the segment of S.R. 108 from 3600 South to 1900 West would be blocked off. Under this scenario, the segment of S.R. 108 north of 3600 South in West Haven would operate at a level of service of LOS B, so no roadway improvements would be needed to meet the projected traffic in 2035.

After the Draft EIS was released, UDOT modified this connection to become a traffic signal with an intersection design that would allow access to S.R. 108 north of 3600 South. As a result, further travel demand modeling showed that the segment of S.R. 108 from 3600 South to 1900 West would need to be improved from a two-lane road to a five-lane road and would have a level of service of LOS B. The improvements to S.R. 108 from 3600 South to 1900 West (a distance of about 1.5 miles) are therefore included in this Final EIS under the action alternatives.

Exhibit 2.1-9: Typical Cross-Section – Raised Center Median

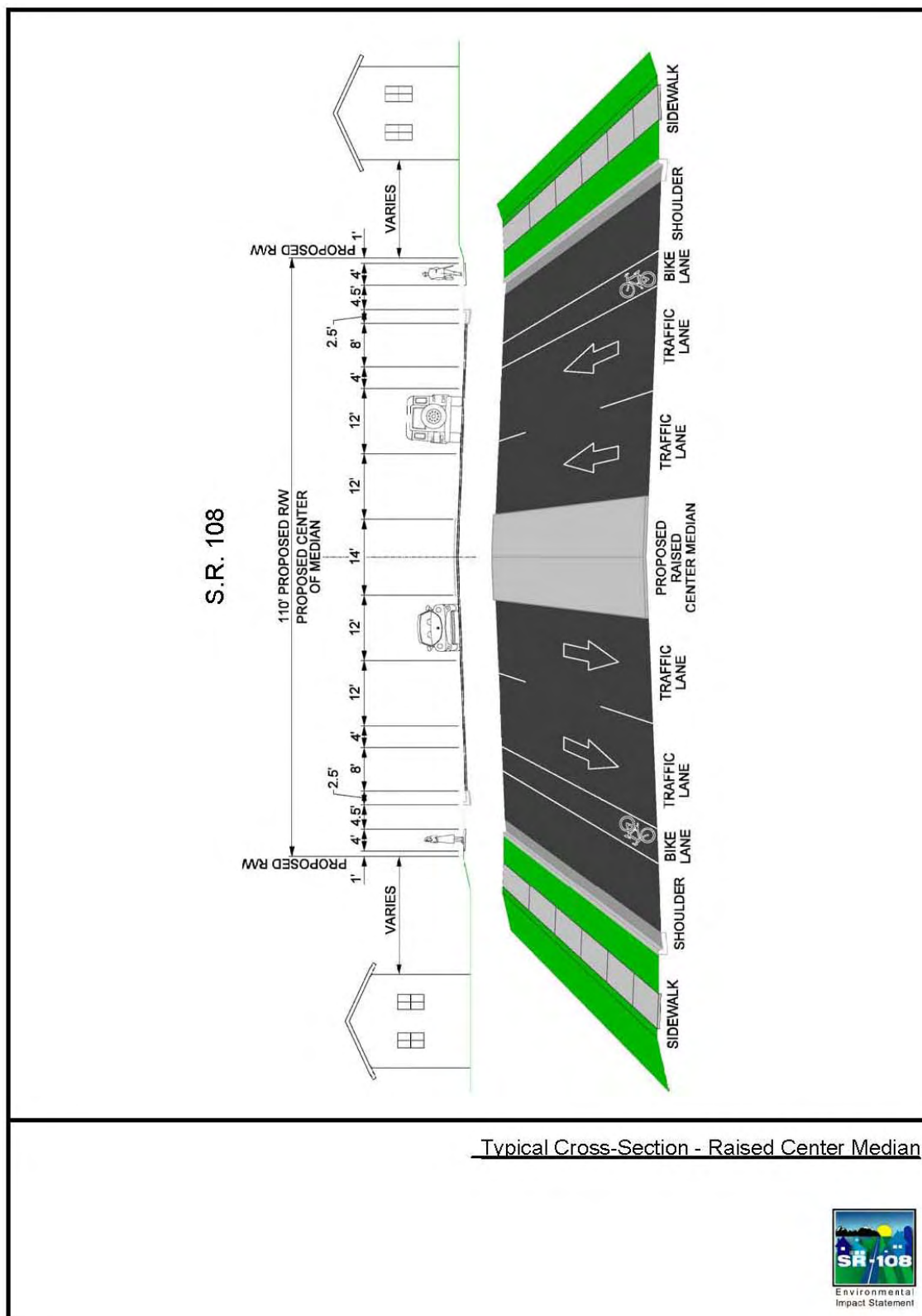
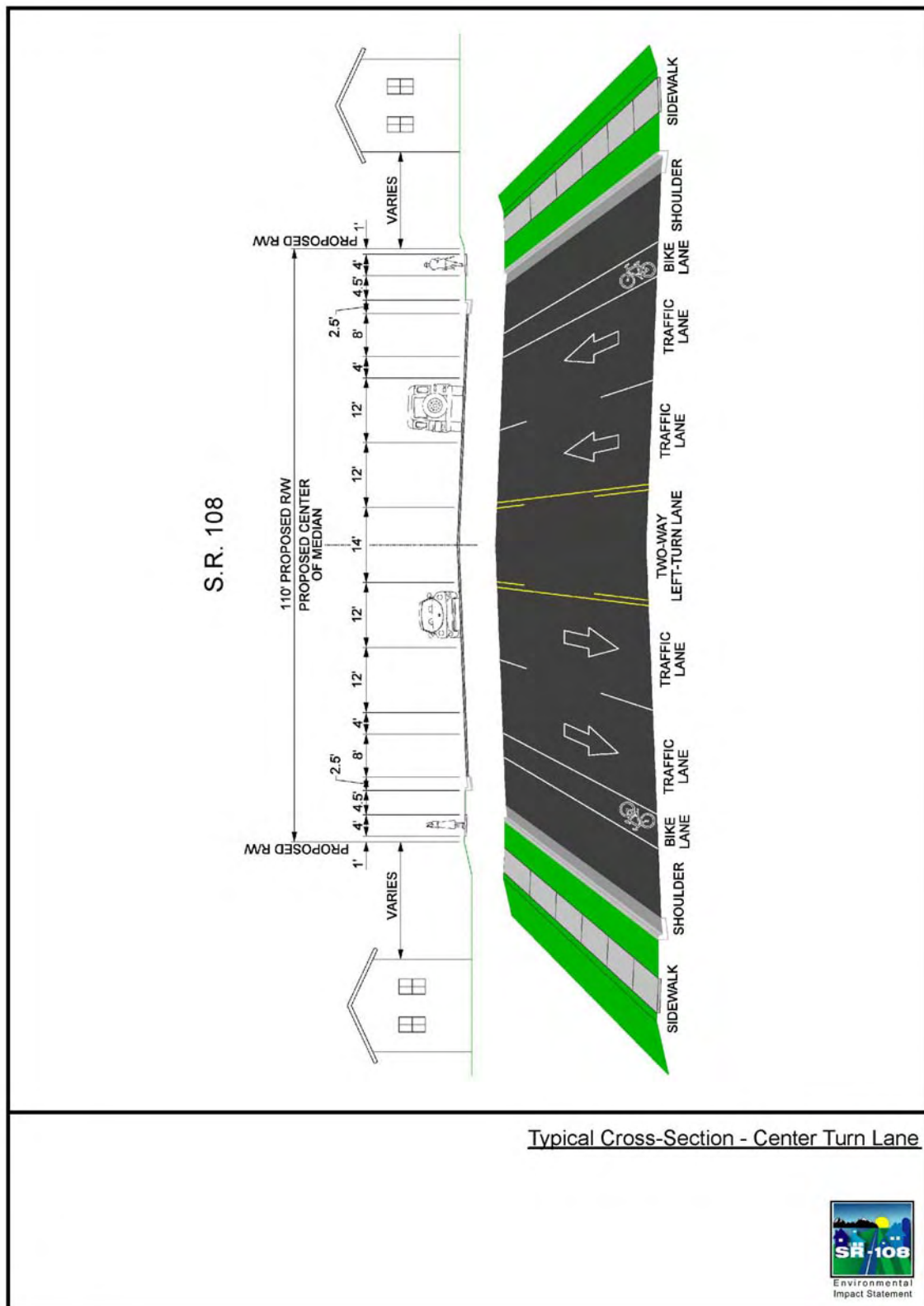


Exhibit 2.1-10: Typical Cross-Section – Center Turn Lane



Roadway Width. A 110-foot roadway width was used for the preliminary five-lane alternatives. The key elements of the project purpose are to reduce roadway congestion on S.R. 108, eliminate roadway deficiencies associated with the lack of shoulders and turn lanes in order to reduce accidents, and provide appropriate bicycle, pedestrian, and transit facilities. All of these elements were considered in developing the roadway width.

To determine the roadway width, standards from both UDOT and the American Association of State Highway and Transportation Officials (AASHTO) were considered. UDOT uses AASHTO’s standards unless UDOT’s standards are more stringent. Exhibit 2.1-11 provides an overview of the elements of the S.R. 108 typical cross-section and the associated standards for each element. The standards shown in Exhibit 2.1-11 for each cross-section element are either the AASHTO standard or UDOT’s more stringent standard to provide optimum roadway safety.

Exhibit 2.1-11: Roadway Cross-Section Elements and Standards

Cross-Section Element	S.R. 108 with 110-Foot Cross-Section (feet)
Median treatment (two-way left-turn lane or raised median)	14 ^a
Travel lane	12 ^b
Bicycle lane	4 ^a
Shoulder	8 ^a
Curb and gutter	2.5 ^a
Park strip	4.5 ^a
Sidewalk	4 ^a
Distance between back of sidewalk and edge of right-of-way	1 ^a

See Exhibit 2.1-9: Typical Cross-Section – Raised Center Median and Exhibit 2.1-10: Typical Cross-Section – Center Turn Lane above for the total cross-section width.

^a UDOT standard

^b AASHTO standard

The total right-of-way width cannot be less than what is required for all the elements of the design cross-section, which include through-traffic lanes, turn lanes, and the border area for bicycle lanes,

How are standards developed?

Roadway standards are based on extensive national historical research and study so that safe and efficient roadways are provided to the public. Standards are developed for specific roadway types and traffic volumes such as arterials similar to S.R. 108.



shoulders, park strips, sidewalks, and utilities. Providing the appropriate roadway width for each element is necessary to meet the project purposes of reducing roadway congestion and improving safety on S.R. 108.

In addition, the context of the surrounding area and its uses were also considered when determining what standards to use for the width of the roadway cross-section. For the S.R. 108 roadway, this context includes a corridor with three schools (which students travel to by walking and biking), a bus route, and numerous residential accesses. The list below explains why the widths shown in Exhibit 2.1-11: Roadway Cross-Section Elements and Standards above were selected for each roadway cross-section element.

- **Median Treatment (Two-Way Left-Turn Lane or Raised Median).** Median treatments for roadways are one of the most effective means for regulating access and the locations of left turns. According to an analysis of accident data from seven states, raised medians can reduce accidents by over 40% in urban areas (Gluck and others 1999). Raised medians also provide extra protection for pedestrians by providing a relatively safe place for pedestrians to stop while crossing the road (FHWA 2001). A study of corridors in several cities in Iowa found that painted two-way left-turn lanes reduced accidents by as much as 70%, improved the level of service by one full grade (for example, from LOS D to LOS C) in some areas, and increased lane capacity by as much as 36% (Iowa Department of Transportation 1997). Both painted and raised medians are commonly used on lower-speed urban arterials like S.R. 108. Both of these types of medians are 14 feet wide, which meets UDOT's and AASHTO's criteria. The 14-foot width is necessary to accommodate left-turn lanes; for painted medians, this includes two 1-foot painted stripes and a 12-foot traffic lane, while for raised medians, this includes a 2-foot separation curb and a 12-foot traffic lane.
- **Travel Lanes and Shoulders.** Twelve-foot travel lanes maximize capacity and increase mobility. According to the 2000 Highway Capacity Manual (AASHTO 2000), a reduction of lane width from 12 feet to 10 feet decreases free-flow speed by 6.6 mph (miles per hour). Reducing the lane and shoulder widths

What is free-flow speed?

Free-flow speed is the term used to describe the average speed that a motorist would travel if there were no congestion or adverse conditions.



on S.R. 108 would reduce the capacity of the road. With reduced shoulder and lane widths, the capacity of the preliminary five-lane alternatives would be reduced to 36,000 vehicles per day, which would result in LOS F for three segments (InterPlan 2006b). This would not meet the project purpose of reducing congestion on S.R. 108, as demonstrated by the roadway's failure to achieve the screening criterion of LOS D.

In addition, S.R. 108 has numerous residential and business accesses. As shown in Section 1.4.4.1, Accidents, S.R. 108 has a high percentage of rear-end accidents (41%) that occur when vehicles are not able to pull out of traffic in order to make turns into residential or business driveways. Providing turn lanes and shoulders that are narrower than the desired standard would not be prudent. In addition, UTA operates bus service on this route, and buses need the maximum shoulder width to pull out of traffic when picking up and dropping off passengers.

- **Bicycle Lane.** WFRC's Bicycle Plan shows a proposed Class III bicycle facility on S.R. 108 for the entire project corridor. A Class III bicycle route provides only a sign for designated bicycle travel on a roadway shared with cars. However, this area would have a heavy volume of vehicle traffic and possible residential street parking. If a Class III bicycle facility is used, the slower-moving bicycles would decrease the roadway capacity and the level of service along S.R. 108, and bicyclists could face a greater safety risk from parked cars (due to people opening car doors in the path of bicyclists). In addition, students would ride bicycles to three schools in the corridor. For this reason, the S.R. 108 project includes a Class II bicycle facility along S.R. 108 because it would remove bicyclists from the vehicle traffic lanes and place them in their own separate lane for improved safety. Bicyclists require a space at least 40 inches wide due to the width of the bicycle and the rider (AASHTO 1999). Therefore, standard-width bicycle lanes with an operating space of 4 feet (48 inches) would be used as the minimum width for any bicycle facility designed for S.R. 108.
- **Park Strip.** The park strip is one element of the border area along the side of the street that is provided for the safety of motorists and pedestrians as well as for aesthetic reasons. The

Why does WFRC make recommendations about bicycle facilities?

WFRC provides general recommendations for the type of bicycle facilities to be implemented on major roads in its jurisdiction in order to accommodate people who bike to work, school, or other locations. The Bicycle Plan helps increase the percentage of non-motorized trips by identifying the areas that are most in need of bicycle improvements and focusing improvements on those areas. The recommendations in the Bicycle Plan are considered by UDOT during the development of a project to ensure that UDOT takes the specific context of the project into account when it makes its final determination about the type of bicycle lane that will be implemented.



park strip serves several purposes including providing a buffer space between pedestrians and vehicle traffic, accommodating the sidewalk, accommodating underground and aboveground utilities, providing a space for road signs, and providing an area to pile snow that is removed from the adjacent road and sidewalks. Removing or reducing the proposed 4.5-foot width of the park strip would place the sidewalk next to or closer to parked vehicles and the traffic lanes on S.R. 108, which would decrease safety for pedestrians and motorists. In addition, utility poles line the roadway along S.R. 108, so the 4.5-foot park strip is necessary for relocating utility poles (with a narrower park strip, the utility poles would encroach on the sidewalk).

- **Sidewalk.** Sidewalks are the second element of the border area. Because they allow residents to access locations along S.R. 108, sidewalks should be provided along both sides of the street. There are three schools directly on S.R. 108 and five other schools whose service boundaries cross S.R. 108. Many students either walk along S.R. 108 or cross it to get to school. Providing the desirable safety standard for sidewalks is important for assuring pedestrian safety. Providing less-than-desirable safety would not be prudent. According to AASHTO, the minimum width for a sidewalk is 4 feet, not including any attached curb, and all sidewalks must be constructed with this width.

During the public scoping period, many residents commented that the existing road was unsafe for pedestrians, including students, because of the lack of shoulders and sidewalks. According to a survey that was provided to Syracuse Elementary School students and parents, 19% of parents who responded would allow their student to walk to school if adequate sidewalks were available (HDR 2006b).

- **Curb and Gutter.** Curb and gutter is necessary in urban areas for controlling access to adjacent properties, draining stormwater runoff, and protecting pedestrians. A 2.5-foot curb and gutter width is required for the S.R. 108 project. The 1-foot curb and 1.5-foot gutter widths are mandated by AASHTO standards in order to accommodate the total flow of stormwater according to drainage requirements.

2.1.3.2 Evaluation of the Preliminary Five-Lane Alternatives

During the second step of level 2 screening, the preliminary five-lane alternatives were screened based on the resource criteria described in Exhibit 2.1-12. These criteria, which are different than those used in level 1 screening, were selected to ensure that the alternatives that would cause the least amount of disruption to the community and the fewest environmental impacts would be carried forward for detailed study in this EIS.

Section 4(f) impacts were given substantial consideration since the FHWA regulations require avoidance of significant public parks, recreation areas, wildlife and waterfowl refuges, and historic sites as part of a project unless there is no feasible and prudent alternative to the use of such land. Impacts to Agriculture Protection Areas (APAs) and wetlands were also weighed strongly because these areas can be used for a roadway project only if there are no practicable alternatives to such impacts. (For a description of Section 4(f) properties, see the section titled Other Considerations on page 2-15.)

Exhibit 2.1-12: Resource Criteria Considered in Level 2 Screening

Criterion	Description
Relocations	The number of residences or businesses that would need to be completely removed because the structure would be within the right-of-way. Relocations would require acquisition of the property.
Potential relocations	The number of residences or businesses where the property would be within the right-of-way and the structure would be within 15 feet of the right-of-way. Potential relocations might require acquisition of the property. During preliminary design, the level of engineering is not detailed enough to determine whether the entire property would need to be acquired. UDOT would make the final determination about whether a property needs to be acquired during the right-of-way negotiation process, which occurs after the final design is completed. By the end of the right-of-way acquisition phase, UDOT will determine whether each potential relocation would be a full relocation or a strip take.
Total property takes	The combined number of relocations, potential relocations, and strip takes. Strip takes are right-of-way impacts to a property that require the acquisition of only a portion of land.
4(f) properties (adverse)	The number of Section 4(f) uses that would be adverse.
Farmland	The number of APAs affected.
Wetlands	The acreage of wetlands that would be filled as a result of the project.



For each alternative, the number of impacts to each of the above resources was determined. Exhibit 2.1-13 provides a summary of the impacts from the preliminary five-lane alternatives.

Exhibit 2.1-13: Summary of Impacts from the Preliminary Five-Lane Alternatives

Alternative	Number of Relocations ^a	Number of Potential Relocations ^a	Number of Strip Takes	Total Property Impacts ^b	Number of 4(f) Uses (Adverse)	Number of APAs Affected	Acres of Wetlands Lost
Center Alignment	31	133	299	463	27	4	0.025
Minimize 4(f) Impacts Alignment	61	47	246	354	14	4	0.025
Center Meander Alignment	42	93	244	379	25	4	0.025
East Alignment	147	42	87	276	33	2	0.039
West Alignment	108	57	167	332	22	2	0.025

^a Includes residential and commercial.

^b Includes relocations, potential relocations, and strip takes.

2.1.3.3 Level 2 Screening Results

The five preliminary alternatives were evaluated against the screening criteria shown in Exhibit 2.1-13 above to determine which alternatives should be eliminated and which should be carried forward for detailed study in this EIS. Exhibit 2.1-14 below summarizes the reasons why the Center, Center Meander, and East Alignments were eliminated from further study and why the Minimize 4(f) Impacts and West Alignments were carried forward for detailed study.

Based on the historic evaluation conducted on the homes along S.R. 108, the properties that were considered Section 4(f) properties have similar integrity and were considered to have equal value when determining which alternative to carry forward. As noted in Section 2.1.3.2, Evaluation of the Preliminary Five-Lane Alternatives, Section 4(f) impacts were given the most consideration when determining which alternative to carry forward.

Exhibit 2.1-14: Level 2 Screening Results (Evaluate Community and Environmental Impacts)

Alternative	Level 2 Screening Results	Discussion
Center Alignment	Eliminated	<ul style="list-style-type: none"> • Third-highest number of combined direct relocations and potential relocations (164). • Highest number of total property impacts (463) when potential relocations and strip takes are included. • Second-highest number of adverse Section 4(f) uses (27). • Highest number of APAs affected (4). • Screening Result: Because it had the highest number of total property impacts and the second-highest number of adverse Section 4(f) uses, the Center Alignment was eliminated from further study.
Minimize 4(f) Impacts Alignment	Carried forward	<ul style="list-style-type: none"> • Fewest number of adverse Section 4(f) uses (14). • Lowest number of relocations and potential relocations (108). • Highest number of APAs affected (4). • Screening Result: Because it had the fewest number of adverse Section 4(f) uses along with the lowest number of relocations and potential relocations, the Minimize 4(f) Impacts Alignment was carried forward for detailed study.
Center Meander Alignment	Eliminated	<ul style="list-style-type: none"> • Second-lowest number of combined direct relocations and potential relocations (135). • Second-highest number of total property impacts (379). • Third-highest number of adverse Section 4(f) uses (25). • Highest number of APAs affected (4). • Screening Result: Based on the high number of adverse Section 4(f) uses and total property impacts, the Center Meander Alignment was eliminated from further study.
East Alignment	Eliminated	<ul style="list-style-type: none"> • Highest number of combined direct relocations and potential relocations (189). • Highest number of adverse Section 4(f) uses (33). • Would require relocation of Syracuse Elementary School, which would result in an impact to the community. • Highest number of wetland impacts (0.039 acre). • Lowest number of APAs affected (2). • Screening Result: Based on the high number of relocations and potential relocations, adverse Section 4(f) uses, the relocation of the elementary school, and impacts to wetlands, the East Alignment was eliminated from further study.
West Alignment	Carried forward	<ul style="list-style-type: none"> • Second-lowest number of adverse Section 4(f) uses (22) and total property impacts (332). • Lowest number of APAs affected (2). • Would improve the level of service and safety by eliminating many access points along one side of S.R. 108, which would improve overall traffic operations and safety. • Screening Result: Because it had the second-lowest number of Section 4(f) impacts and total property impacts and because it would improve the level of service and safety, the West Alignment was carried forward for detailed study.



2.2 Alternatives Considered for Detailed Study

The three alternatives carried forward for detailed study in this EIS are the No-Action Alternative (to be used as a baseline), the Minimize 4(f) Impacts Alternative, and the West Alternative. This section provides a detailed description of each alternative. In order to conduct a detailed evaluation of these alternatives, preliminary engineering and cost estimates were developed for both of the action alternatives. In addition, the alternative alignments were further refined from level 2 screening to minimize impacts to the communities and the natural environment. The roadway alignment alternatives for S.R. 108 were based on the need to improve safety and eliminate existing design deficiencies, improve mobility and level of service, and meet the goals in the local community land use plans.

Which alternatives were carried forward for detailed study in this EIS?

The three alternatives carried forward for detailed study in this EIS are the No-Action Alternative, the Minimize 4(f) Impacts Alternative, and the West Alternative. The Minimize 4(f) Impacts Alternative and the West Alternative would both widen S.R. 108 to five lanes (four travel lanes with either a two-way left-turn lane or a center raised median).

2.2.1 No-Action Alternative

NEPA requires an analysis of the No-Action Alternative. This alternative serves as a baseline so that decision-makers can compare the environmental effects of the action alternatives.

If the No-Action Alternative is selected, no improvements to S.R. 108 or adjacent transportation facilities would be made other than those improvements already identified in the WFRC long-range plan to enhance mobility in the area. These activities, which might have some environmental impacts, would be evaluated in a separate document.

If no action is taken on S.R. 108, UDOT and the cities would likely continue to make minor maintenance improvements such as rehabilitating pavement and improving shoulders, turn lanes, sidewalks, and curb and gutter. The cities might require developers to provide some of these improvements as part of any new development along S.R. 108. Overall, the basic two-lane configuration of S.R. 108 would not change under the No-Action Alternative.

2.2.2 Action Alternatives

2.2.2.1 Project Features

In order to evaluate the action alternatives in detail, preliminary engineering was conducted to determine the right-of-way requirements for each alternative. The specific right-of-way for each alternative was then evaluated to determine its impacts to the community and the natural environment (for a detailed discussion of impacts, see Chapter 4, Environmental Consequences). To conduct this evaluation, each alignment considered for the action alternatives was reviewed in a series of steps to determine the final roadway design and alignment.

Environmental and Community Considerations

To further refine the action alternatives to minimize impacts to the communities and the natural environment, various resources were considered including wetlands, threatened and endangered species (including habitat), farmland, water quality, the social setting, cultural resources, and Section 4(f) uses. When creating the alternatives, literature searches as well as input from the public and resource agencies during alternative workshops that were held in October 2006 were considered. The alignments were modified where necessary to minimize impacts, primarily to Section 4(f) resources.

During the development of the action alternatives, local communities were also asked for input regarding project features. The City of Clinton would like to build an underpass across S.R. 108 to use as a school crossing and to connect the western part of the city to a planned park and city buildings. Neither of the action alternatives would prevent an underpass from being built.

Engineering Considerations

Engineering considerations for S.R. 108 included overall roadway safety, typical cross-sections, utility lines and relocations, and Section 4(f) uses. Both action alternatives were designed with a 45-mph design speed. For the most part, all transitions were designed with a maximum horizontal curve radius to eliminate the need for superelevation (that is, a normal crown section was used), using reverse curves with radii of 6,500 feet (AASHTO 2004, 168).

What are superelevation and normal crown section?

Superelevation is a roadway design technique that involves tilting the roadway to help offset the centripetal forces that develop as a vehicle goes around a curve.

Normal crown section is the minimum cross slope required to accommodate drainage of the roadway; usually 2% each direction from centerline.



The alignment for both action alternatives extends north to 1900 West and includes the proposed Hinckley Drive extension (see Section 1.3.4, Related Projects).

Alternative Cost Estimate

To assist in comparing the action alternatives, preliminary cost estimates were developed and are shown in Exhibit 2.2-1. These estimates are based on the preliminary engineering conducted for the action alternatives and include the total project cost for construction, right-of-way acquisition, utility relocation, and design engineering. Estimates were developed for a base cost using unit construction costs prevailing in 2007 and assuming the project would be constructed in 2007 without increases due to inflation over the period until the year of expenditure, when the project would be constructed.

Some federal and state funding sources have been identified for the S.R. 108 project, with \$20 million programmed in the 2008 State Transportation Improvement Program.

Exhibit 2.2-1: Preliminary S.R. 108 Cost Estimate

Type of Cost	Minimize 4(f) Impacts Alternative	West Alternative
<i>Segment 1 – S.R. 127 to 1300 North</i>		
Right-of-way ^a	\$48,400,000	\$53,300,000
Design and construction	\$24,900,000	\$24,900,000
<i>Segment 2 – 1300 North to 4800 South</i>		
Right-of-way ^a	\$31,800,000	\$45,200,000
Design and construction	\$23,900,000	\$24,000,000
<i>Segment 3 – 4800 South to S.R. 126</i>		
Right-of-way ^a	\$27,200,000	\$32,400,000
Design and construction	\$21,900,000	\$21,900,000
<i>All Segments</i>		
Total	\$178,100,000	\$201,700,000

^a Right-of-way cost includes utility relocations and construction easements.

Construction Phasing

Improvements to S.R. 108 would occur as funding becomes available. Initial construction is expected to start in 2010.

2.2.2.2 Minimize 4(f) Impacts Alternative (Preferred Alternative)

The Minimize 4(f) Impacts Alternative involves widening S.R. 108 to a 110-foot, five-lane cross-section. In order to minimize the use of Section 4(f) properties, the alignment varies between the center alignment, west alignment, and east alignment. The transition from one alignment to the next was made with reverse curves requiring no superelevation based on a design speed of 45 mph.

Construction phasing and maintenance of traffic would be more complex with this alternative due to the transitions and because the alignment shifts from one side of the road to the other. However, the Minimize 4(f) Impacts Alternative would allow more flexibility to refine the alignment in the future to miss important utilities.

Typical Cross-Sections

For the Minimize 4(f) Impacts Alternative, two typical cross-sections were developed: a cross-section with a center two-way left-turn lane and a cross-section with a raised center median. The following elements would be included in both the center turn lane and raised center median typical cross-sections:

- Five-lane (110-foot) cross-section consisting of four 12-foot travel lanes, a 14-foot median (either a two-way left-turn lane or a raised center median), 8-foot shoulders, 4-foot bicycle lanes, 2.5-foot curb and gutter, 4.5-foot park strips, 4-foot sidewalks, and 1 foot between the back of the sidewalk and the edge of the right-of-way.
- Although the exact location of raised medians would be determined during the final design of the project, raised medians would be considered in high-traffic areas such as commercial districts and schools to improve safety. Proposed medians to improve school safety would be at 1700 South mid-block for Syracuse Elementary and Syracuse Junior High Schools, at 700 South in Syracuse adjacent to the new Syracuse High

Where can I find more information about the roadway design evaluated in this EIS?

See Appendix A, Roadway Plans, for more information about the design evaluated in this EIS for the Minimize 4(f) Impacts Alternative.



School, and at 550 North in West Point. A further evaluation showed that the use of dual left-turn lanes without raised medians would improve the level of service to LOS D or better in all segments of S.R. 108.

- Improve most intersections with dedicated right-turn and left-turn lanes. Dual left-turn lanes would be provided at 1700 South (southbound only), 1800 North, 5600 South, and 4800 South.
- Include enough shoulder width to accommodate bus service.
- Support bicycle use along S.R. 108 by providing Class II bicycle lanes.

Detention Basins

As part of the S.R. 108 improvements, a stormwater drainage system would be constructed to control the additional runoff that would result from the increase in impervious (paved) area due to the project. In some cases, the peak flow rate of the runoff would be controlled to match existing conditions in order to use existing storm drain features and prevent downstream flooding. Stormwater detention basins, grassed swales, or a combination of control features would be used to store stormwater runoff and reduce peak flows. These stormwater controls also improve water quality by allowing sediment and other pollutants to settle out of the water before being discharged to receiving waters.

The initial stormwater system and detention features are based on the preliminary design (about 20%) developed for this EIS. The locations of the proposed detention basins are shown in Appendix A, Roadway Plans. The potential impacts of this system were evaluated in the EIS; however, after the EIS is completed and the project goes into final design, the stormwater system would be developed in more detail and the location of storage features might be revised.

Utility Relocations

Several utilities are within the S.R. 108 right-of-way including electric (overhead lines and buried lines), gas, water, telephone/fiber optic, and irrigation. If these utilities need to be relocated as part of a design improvement, they would be relocated within the construction area (cut and fill) required for S.R. 108. There is a Rocky Mountain

Power substation at the northwest corner of S.R. 108 and 5600 South. The design improvements in this area will avoid the substation due to the high cost of relocating it.

2.2.2.3 West Alternative

The West Alternative also involves widening S.R. 108 to a 110-foot, five-lane cross-section. The centerline of this alignment is located such that the proposed right-of-way line along the east side of S.R. 108 matches the existing right-of-way line along the east side of S.R. 108.

The West Alternative would better facilitate construction phasing because the new roadway could be built while existing lanes of traffic are kept open during the initial phase of construction. Additionally, the West Alternative would eliminate existing accesses along the west side of S.R. 108, which would help reduce congestion and improve safety by reducing the number of vehicles making right and left turns onto and off of the roadway. This alternative would avoid impacts to Syracuse Elementary School, minimize impacts to the new Syracuse High School near 700 South in Syracuse, and avoid the one existing wetland along S.R. 108 in Roy.

Typical Cross-Sections

The typical cross-sections for the West Alternative would be the same as those described in Section 2.2.2.2 for the Minimize 4(f) Impacts Alternative.

Detention Basins

The stormwater system and detention basins would be similar to those described for the Minimize 4(f) Impacts Alternative.

Where can I find more information about the roadway design evaluated in this EIS?

See Appendix A, Roadway Plans, for more information about the design evaluated in this EIS for the West Alternative.



Utility Relocations

Several utilities are within the S.R. 108 right-of-way including electric (overhead lines and buried lines), gas, water, telephone/fiber optic, and irrigation. If these utilities need to be relocated as part of a design improvement, they would be relocated within the construction area (cut and fill) required for S.R. 108. There is a Rocky Mountain Power substation at the northwest corner of S.R. 108 and 5600 South. The design improvements in this area will avoid the substation due to the high cost of relocating it.

2.2.3 Comparison of Alternatives

Exhibit 2.2-2 below lists the major advantages and disadvantages of each alternative that was evaluated in detail. Exhibit S.4-2: Comparison of Environmental Impacts in Chapter S, Summary, summarizes the specific environmental impacts for each alternative. Environmental impacts are discussed in detail in Chapter 4, Environmental Consequences. Potential mitigation measures for the impacts are summarized in Section 4.24, Mitigation Summary.

Exhibit 2.2-2: Primary Advantages and Disadvantages of the Alternatives

Alternative	Primary Advantages	Primary Disadvantages
No-Action Alternative	<ul style="list-style-type: none"> Few environmental impacts because no major improvements would be made to S.R. 108 to reduce congestion, eliminate roadway deficiencies, or improve safety. 	<ul style="list-style-type: none"> Would not be consistent with local or regional land use and transportation plans. Loss of business from continued heavy congestion on S.R. 108. Greatest number of residences with noise levels above the noise-abatement criterion (347). Does not provide bicycle lanes, sidewalks, or transit facilities. S.R. 108 would continue to operate at unacceptable levels of service.
Minimize 4(f) Impacts Alternative (Preferred Alternative)	<ul style="list-style-type: none"> Least amount of farmland lost (26.1 acres). Least amount of land converted to roadway use (34 acres). Fewest total residential relocations (55). Fewest business relocations (6). Fewest potentially eligible architectural historic properties that would be adversely affected (14). Fewest Section 4(f) properties used (14). Lowest cost of the action alternatives. 	<ul style="list-style-type: none"> Greatest number of APAs affected (4). Second-greatest number of residences with noise levels above the noise-abatement criterion (300).
West Alternative	<ul style="list-style-type: none"> Fewest number of APAs affected (2). Fewest number of residences with noise levels above the noise-abatement criterion (250). 	<ul style="list-style-type: none"> Greatest amount of land converted to roadway use (38 acres). Greatest amount of farmland lost (27.9 acres). Greatest number of residential relocations (96). Greatest number of business relocations (12). Greatest number of potentially eligible architectural historic properties that would be adversely affected (22). Greatest number of Section 4(f) properties used (22). Highest cost of the action alternatives.



2.2.4 Basis for Identifying the Preferred Alternative

The Minimize 4(f) Impacts Alternative was identified by FHWA and UDOT as the Preferred Alternative based on public input during the scoping process, based on the alternative's ability to meet the elements of the project's purpose, and because the alternative minimizes impacts to Section 4(f) properties as well as overall residential and business relocations.

During the EIS scoping process, the public and the resource agencies were asked to provide input on potential issues and alternatives to be considered in the EIS. Most people who provided comments noted that something needed to be done to improve S.R. 108. Of those comments, most stated that widening S.R. 108 was an appropriate solution.

As part of the process for identifying the Preferred Alternative, UDOT met with planners, managers, and engineers from all five cities along S.R. 108, presented the Minimize 4(f) Impacts and West Alternatives to them, and explained how the alternatives would affect their cities. City officials from all five cities said that the Minimize 4(f) Impacts Alternative met their city's plans and objectives.

Both the Minimize 4(f) Impacts and West Alternatives meet the three elements of the project's purpose described in Section 1.2.1, Purpose of the Project. However, as noted above in Exhibit 2.2-2: Primary Advantages and Disadvantages of the Alternatives, this alternative would meet those objectives while requiring the least amount of land to be converted to roadway use. This alternative also meets the project's purpose with fewer residential and business relocations and fewer impacts to Section 4(f) properties.

The environmental impacts of the two action alternatives were compared according to the resource categories analyzed in this EIS. The comparison of alternatives in Exhibit S.4-2: Comparison of Environmental Impacts shows that the impacts from the action alternatives would be the same or very similar for most resources. The action alternatives differ primarily in terms of their right-of-way, relocations, and Section 4(f) impacts.

Based on this information, the Minimize 4(f) Impacts Alternative was identified as the Preferred Alternative for the following reasons:

- It requires less land to be converted to roadway use.
- It has fewer uses of Section 4(f) properties.
- It requires fewer residential and business relocations.
- It has the lowest cost.
- It has the least impact to farmland.



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